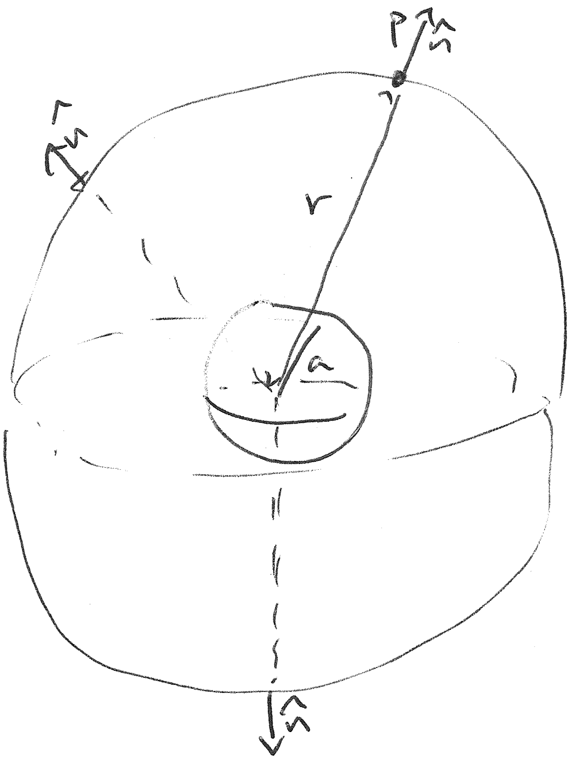


$$Q_{\text{ENCLOSED}} = Q$$

$$\boxed{\Phi = \frac{Q}{\varepsilon_0}}$$: GAUSS'S LAW

$$\Phi = \oint \vec{E} \cdot d\vec{A}$$

$$= \oint \vec{E} \cdot \hat{n}\, ds$$

$$= \oint \vec{E} \cdot \hat{r}\, ds$$

$$\vec{E} = E(r)\,\hat{r}$$

$$= \oint E(r)\,\hat{r} \cdot \hat{r}\, ds$$

$$= \oint_{\text{SURFACE}} E(r)\, ds$$

$$\boxed{\Phi = E(r)\, 4\pi r^2}$$

$$\Phi = \frac{Q}{\varepsilon_0} = E(r)\, 4\pi r^2$$

$$E(r) = \frac{1}{4\pi\varepsilon_0} \frac{Q}{r^2}$$

$r < a$ a: RADIUS OF UNIFORMLY CHARGED SPHERE

$$Q_{ENCLOSED} = Q\frac{r^3}{a^3}$$

$$\boxed{\Phi = \frac{Q\frac{r^3}{a^3}}{\varepsilon_0} = \frac{Q r^3}{\varepsilon_0 a^3}}$$

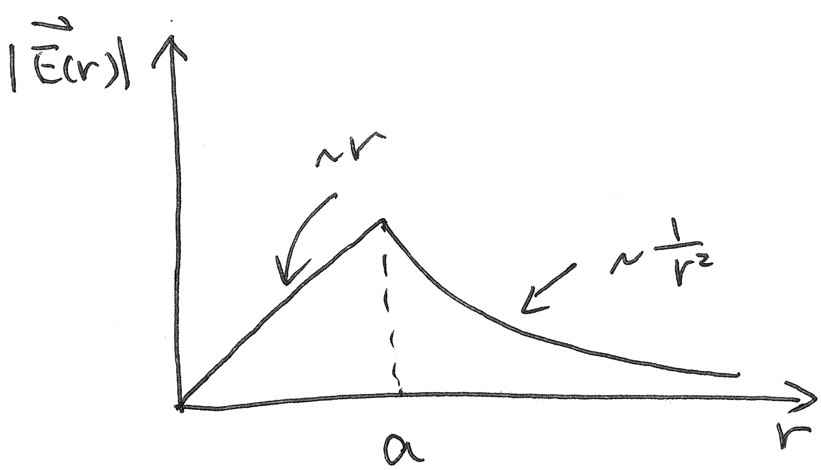
$$\vec{E}(r) = E(r)\,\hat{r}$$

$$\boxed{\Phi = E(r)\cdot 4\pi r^2}$$

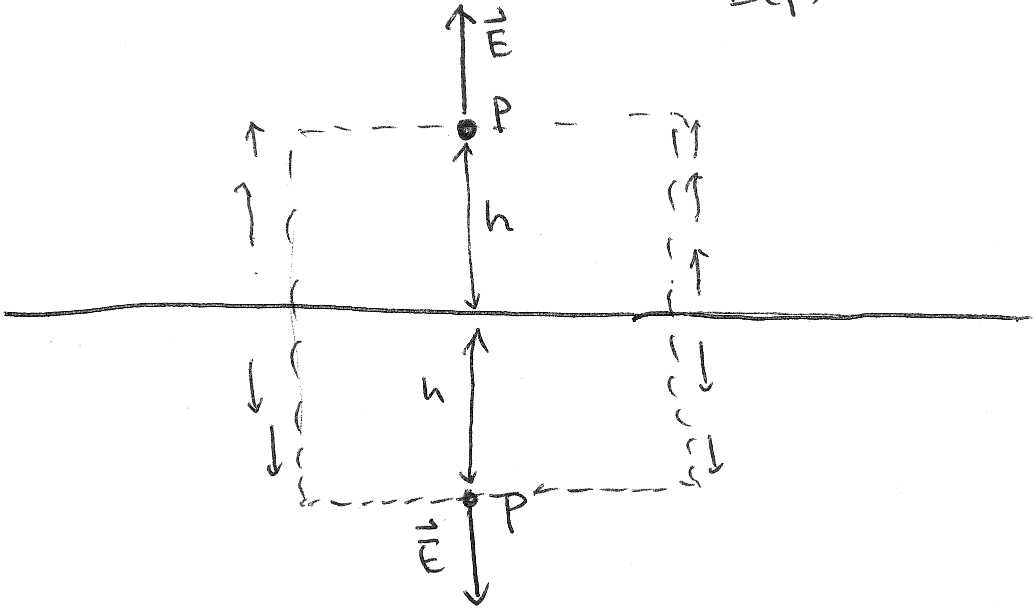
$$E(r)\cdot 4\pi r^2 = \frac{Q r^3}{\varepsilon_0 a^3}$$

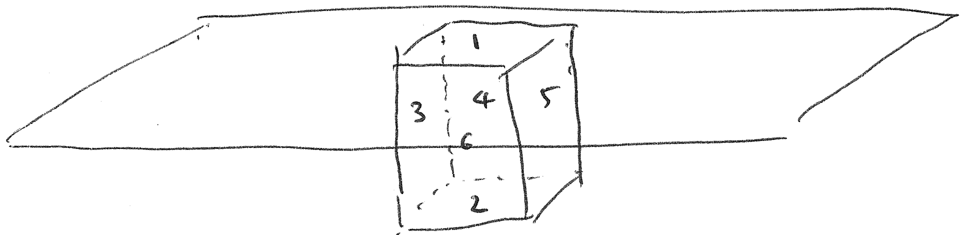
$$E(r) = \frac{1}{4\pi\varepsilon_0 r^2}\,\frac{Q r^3}{a^3}$$

$$E(r) = \frac{1}{4\pi\varepsilon_0}\,\frac{Q r}{a^3}$$



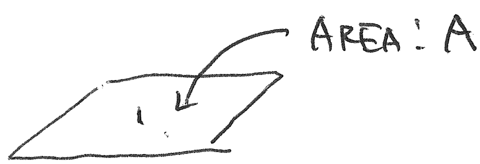
$\vec{E}(\vec{p})$?





$$\Phi_{3,4,5,6} = 0$$

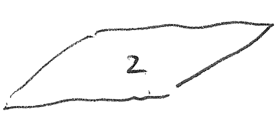
$$\Phi_{TOTAL} = \frac{Q_{ENCLOSED}}{\varepsilon_0} = \Phi_1 + \Phi_2 + \overset{0}{\cancel{\Phi_3 + \Phi_4 + \Phi_5 + \Phi_6}}$$

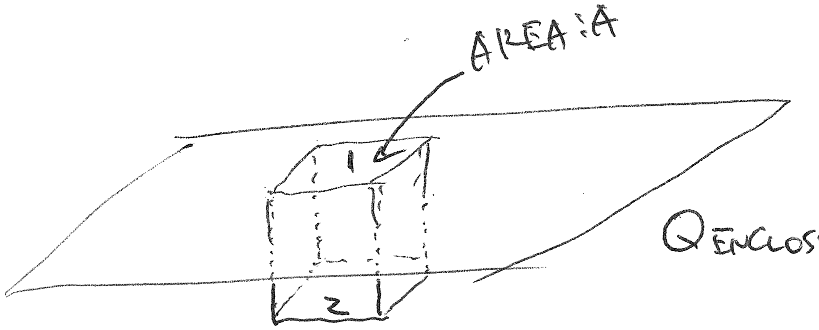


$$\Phi_1 = E(\vec{p}) \cdot A$$

$$\Phi_2 = E(\vec{p}) \cdot A$$

$$\boxed{\Phi_{TOTAL} = 2E(\vec{p}) \cdot A}$$





$$Q_{ENCLOSED} = \sigma A$$

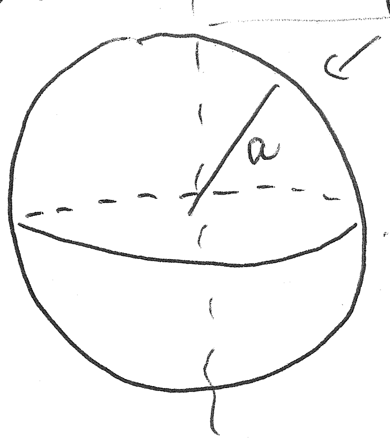
$$\Phi = 2E(\vec{p}) \cdot A = \frac{\sigma A}{\varepsilon_0}$$

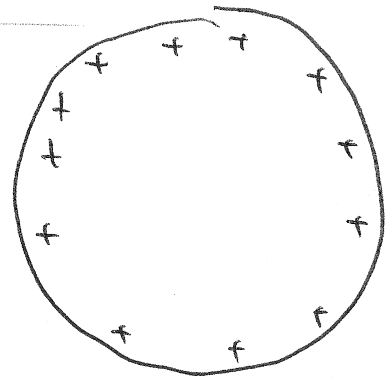
$$E(\vec{p}) = \frac{\sigma A}{\varepsilon_0} \cdot \frac{1}{2A}$$

$$E(\vec{p}) = \frac{\sigma}{2\varepsilon_0}$$

CONDUCTORS:

PUT + CHARGE

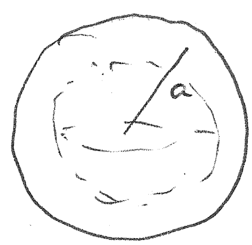




1. CHARGE IS AT SURFACE

2. $\vec{E}_{\text{INSIDE}} = 0$

$r < a$ $\quad \vec{E} = 0$

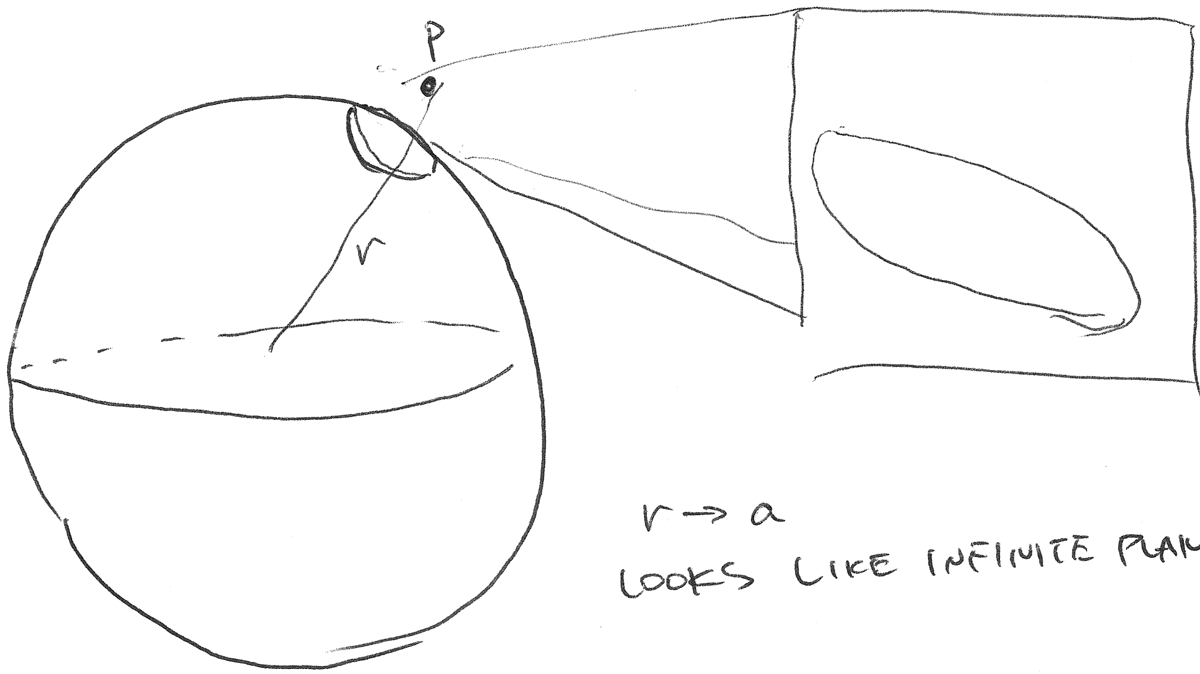


$Q_{\text{ENCLOSED}} = 0$

↳ $\vec{E} = 0$ BY GAUSS'S LAW

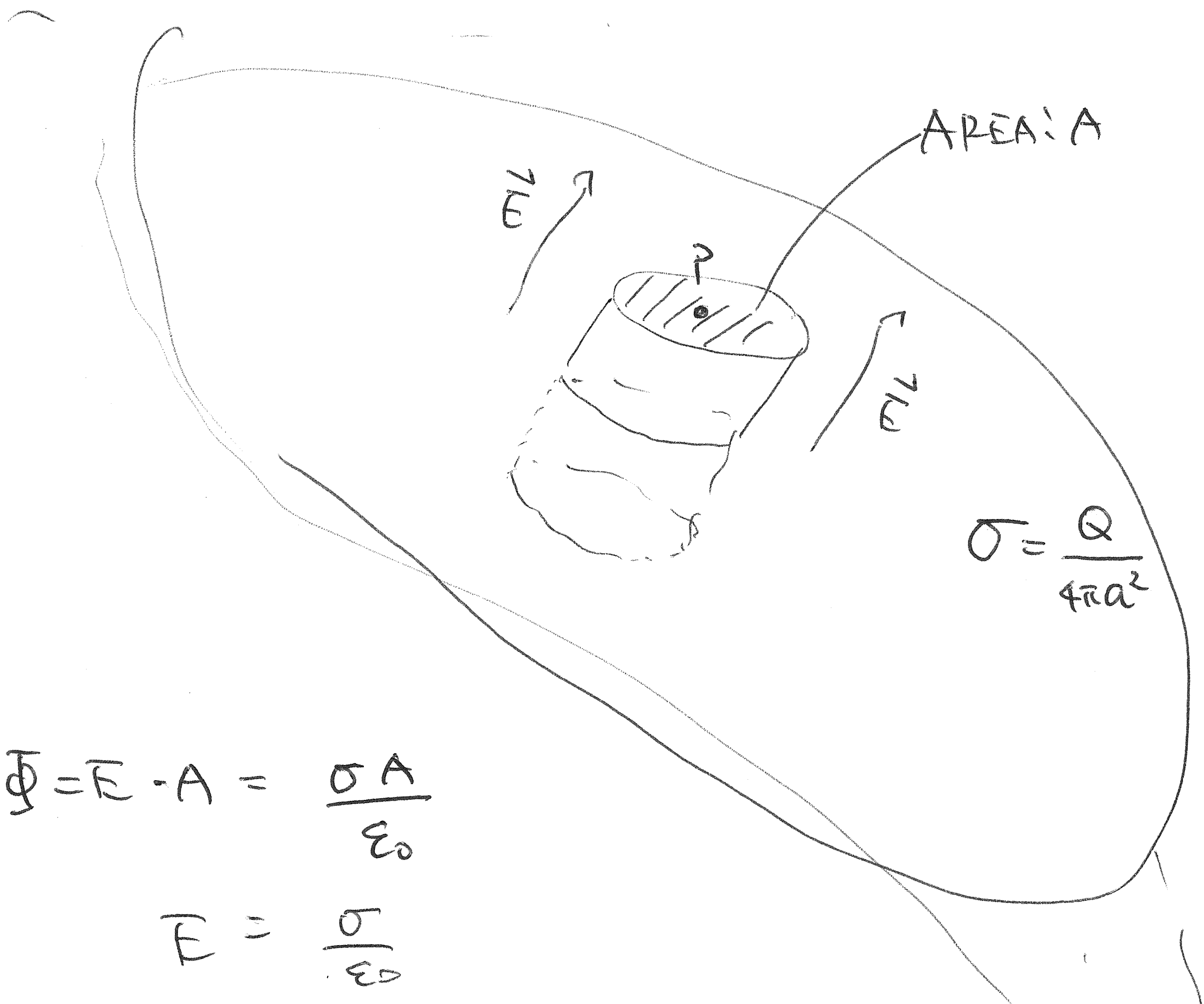
$r > a$ $\quad \vec{E}(r) = ?$ IF CONDUCTOR IS CHARGED TO Q

$$\vec{E} = \frac{1}{4\pi\varepsilon_0}\frac{Q}{r^2}\hat{r}$$



$r \to a$

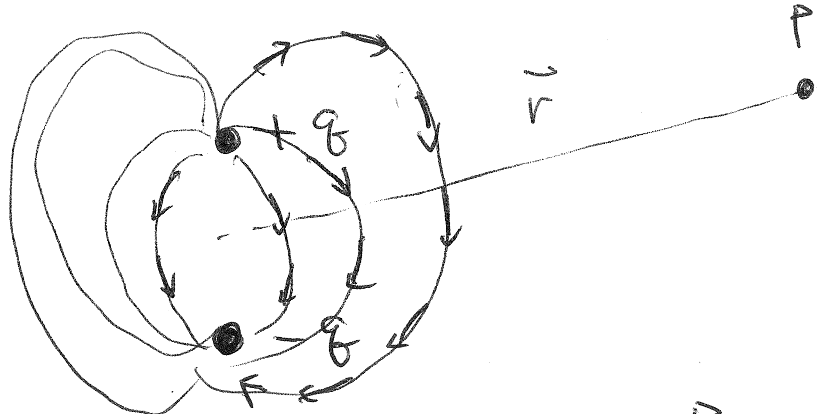
LOOKS LIKE INFINITE PLANE



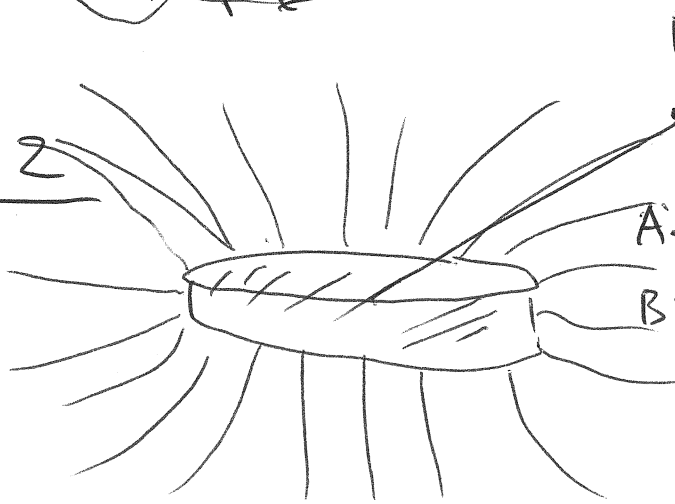
$$\sigma = \frac{Q}{4\pi a^2}$$

$$\Phi = E \cdot A = \frac{\sigma A}{\varepsilon_0}$$

$$E = \frac{\sigma}{\varepsilon_0}$$



#2



A: YES

B: NO